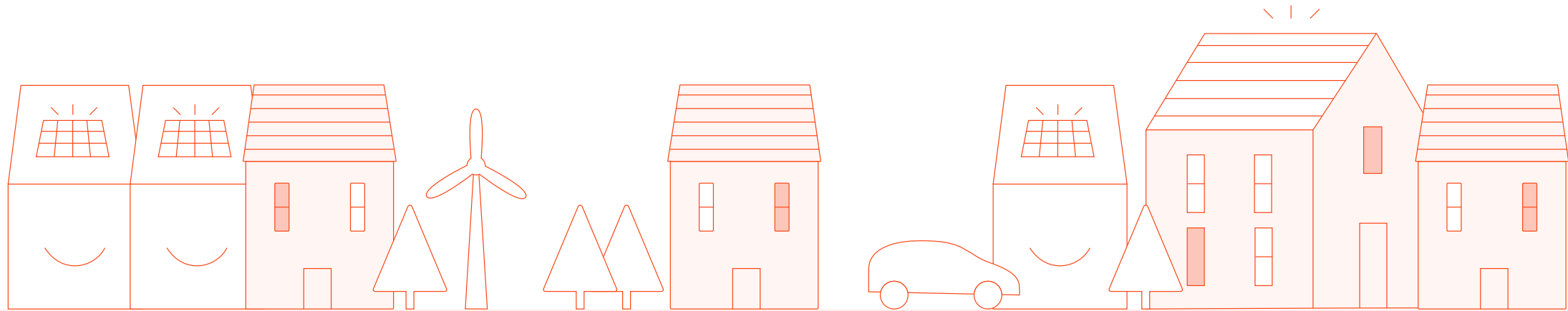


Delivering Zero Carbon by the 2030s

New Build Specification

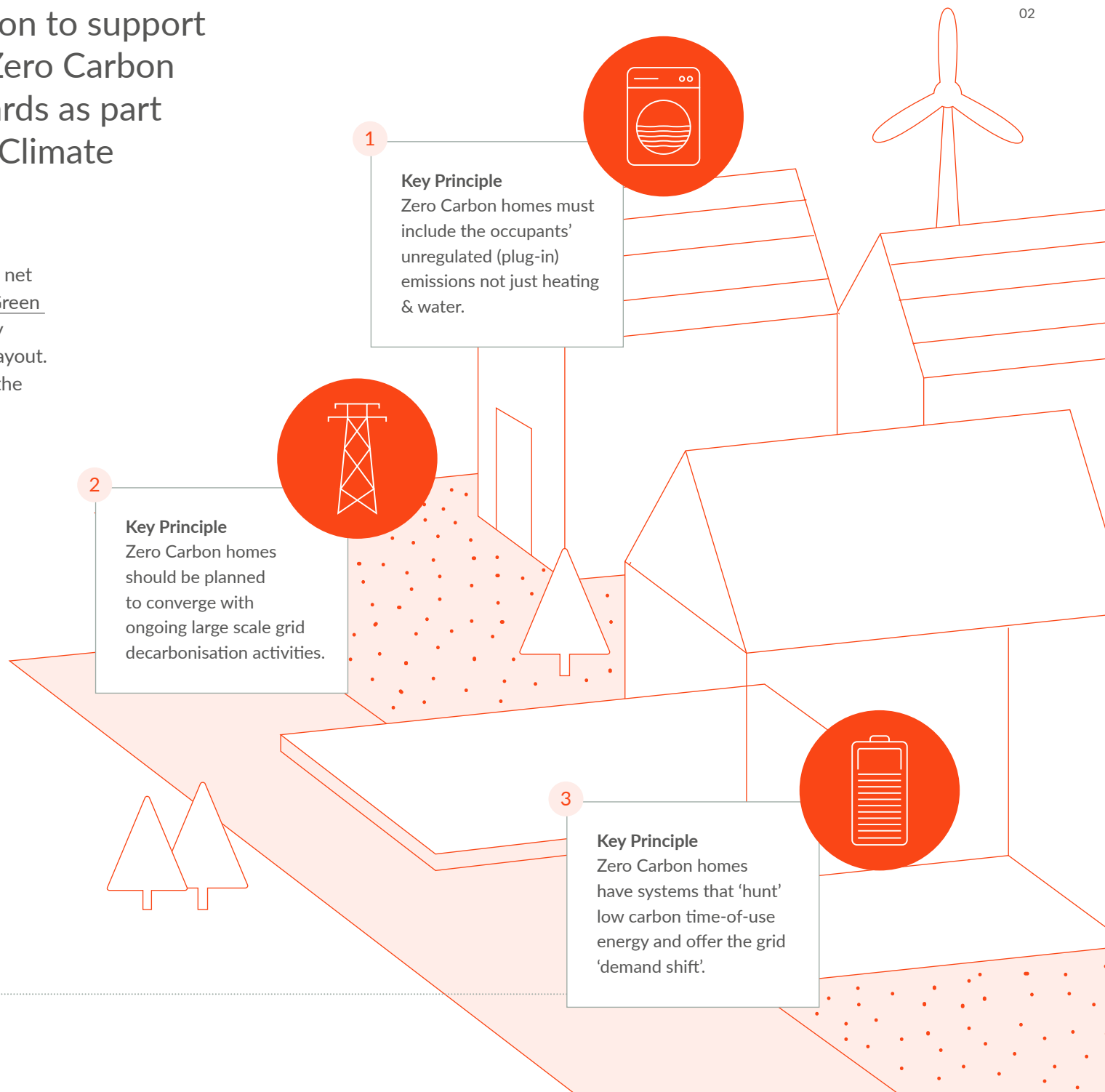


sero

We are sharing this specification to support faster and wider adoption of Zero Carbon new build construction standards as part of the urgent response to the Climate Emergency.

Homes built to this performance standard will be truly net zero carbon in operation, in accordance with the [UK Green Build Council's](#) definition, during the 2030s – precisely when, depends on the details of the individual home layout. Evidence of this will be proven in the performance of the homes post-construction.

To provide a more precise estimate of which year your home(s) will achieve Net Zero, you can go to the Sero website later this year and use our free tool to see how your scheme performs, and how using this specification will affect your Zero Carbon by date.



On 17th August 2021, Welsh Government published – [“Welsh Development Quality Requirements 2021; Creating Beautiful Homes and Places”](#). WDQR’21 This sets out the minimum standard to be applied to all publicly funded affordable housing schemes from 1st October 2021 onwards. The WDQR’21 standard covers value for money, room sizes, flexibility and security, but also has a significant focus on energy and decarbonisation requirements.

Sero’s Delivering Zero Carbon by the 2030s New Build Specification meets or exceeds all the relevant energy and carbon elements required in WDQR’21.

Adhering to Sero’s specification will not only deliver WDQR’21 relevant elements, but should avoid the need for the homes to ever require retrofit works to decarbonise them. Outside of normal repair, maintenance and replacement cycles, these homes will not typically require fabric or services upgrades in order for them to become Zero Carbon by the 2030s – the decarbonisation of the National Grid carries them the rest of the journey.

Prefer to pay in installments?

For those concerned about capital construction viability, there is an alternative two step route that defers some of the costs.

WDQR’21 can often be satisfied by delivering the core fabric, ventilation, controls, heat source and heat store elements outlined in this specification (though that should be confirmed house-by-house). This approach targets the elements of the new build specification that are hardest to retrofit and ensures these are built to the appropriate standard.

The omitted elements would commonly include the electrical storage and renewable generation. The need for these to be installed is deferred for a future retrofitting intervention, which is recorded in the home’s “Pathway to Zero”. At construction of the new home, the only capital costs will be making allowances for space and cabling provisions for the future installations.

The cost of the deferred elements is not actually avoided, since the expectation is all recently built homes will need to achieve Net Zero in the 2030s, but it is postponed into the future. This approach may benefit from reduced future component costs, though undertaking a retrofit within an occupied home may well incur greater costs elsewhere.



What about Embodied?

The specification focuses on operational carbon. We will be releasing work to incorporate embodied carbon in materials (and latterly constructional carbon), later next year. For now, we'd advise minimising anything hot or heavy!

What about Carbon Offsets?

We do not believe carbon offsets are an acceptable or robust part of decarbonising homes – they are best left to industries that have no technical solutions to decarbonise (unlike homes). On that basis, we don't include offsets in achieving Net Zero.

What about Passivhaus?

Passivhaus provides a very high fabric performance standard and robust commissioning regime. We're fans! But it doesn't achieve Zero Carbon on its own. You could choose to extend the fabric elements of this specification to achieve Passivhaus, especially if your delivery team can optimise construction costs. It certainly won't harm achieving Zero Carbon, though it won't shave that many years off the date that you achieve it.

What about EPC "A" and SAP?

This specification will achieve an Energy Performance Certificate (EPC) rating of "A" and the underlying Standard Assessment Procedure (SAP) score of 92 in all circumstances we have envisaged. You'll need to run your own home designs to confirm as part of Building Regulations. This spec. also exceeds Building Regs. on the same basis.

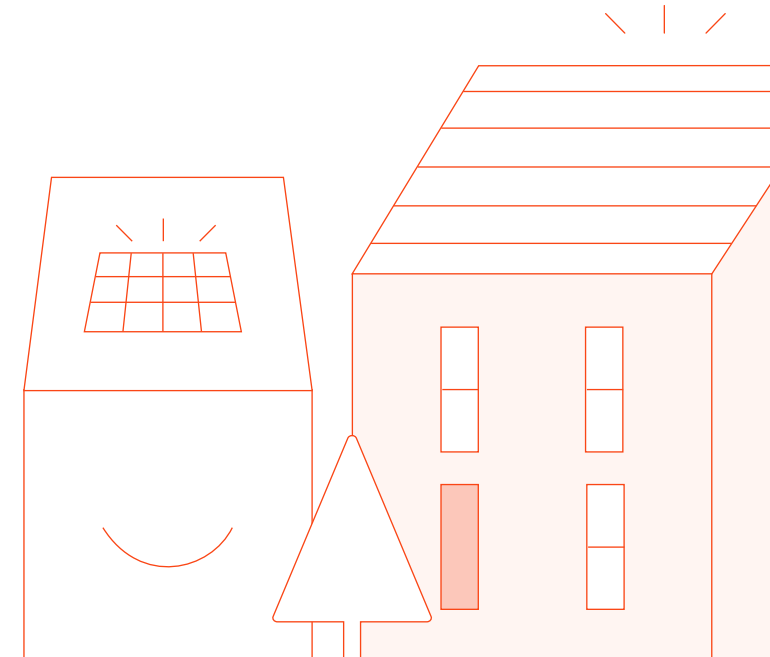
What about Fabric Energy Efficiency requirements?

We believe the more pragmatic route is elemental U-values and Y-values. This allows all home types and sites to follow the same construction build-ups, enabling greater consistency on site to give fewer errors, whilst also being better suited to MMC/ Offsite/ DfMA approaches that favour standardisation. Whilst Building Regulations no longer uses an average Y-value, this is given here as an overall metric and can still be found as an output in the design stage SAP calculations.

The Small Print

As is inevitably the case when generalising, this summary provides general "rules of thumb". These will need to be calculated for each individual, unique home and will further vary due to construction quality and occupants' behaviours.

This document has also been deliberately written as a short summary, and therefore assumes a level of understanding from the reader and cannot be comprehensive for all instances – please get in touch if you have specific circumstances you need solutions for.






This home specification achieves Zero Carbon by the 2030s through a higher capital construction cost (against a minimum performance baseline) for a slightly lower ongoing resident energy bill. It minimises space heat demand by using MVHR (but not quite to the extent that Passivhaus would reduce this energy demand element), and has slightly less reliance on a battery and grid optimisation for Net Zero.

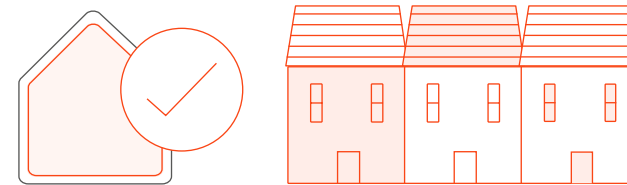
Overheating

Overheating is a significant issue that will cost lives as our climate changes, and has historically been poorly tackled. Each new home should have an overheating strategy that has the minimum reliance on the home's residents being present at the time and knowing how to act. Homes should firstly be designed to prevent excessive solar gain getting into the thermal envelope, and then to passively absorb or dissipate by design where exclusion cannot be achieved. If overheating cannot be controlled with these approaches, low carbon 'active' cooling should be considered (such as using groundwater).

We're planning to build a tool to help better assess overheating next year, but until then the [Good Homes Alliance assessment tool](#) and [CIBSE TM52](#) provide a good starting point.

Form Factor & Design

-  Gross Internal Area : External Surface Area $\leq 1:3$
(with storey heights $<2.7\text{m}$ and external surface area measured at the thermal envelope and including party walls)
-  Dormers & balconies avoided (or fabric enhanced)
-  Glazing & doors $\leq 25\%$ total wall area (including party walls)



Fabric Performance & Bridging

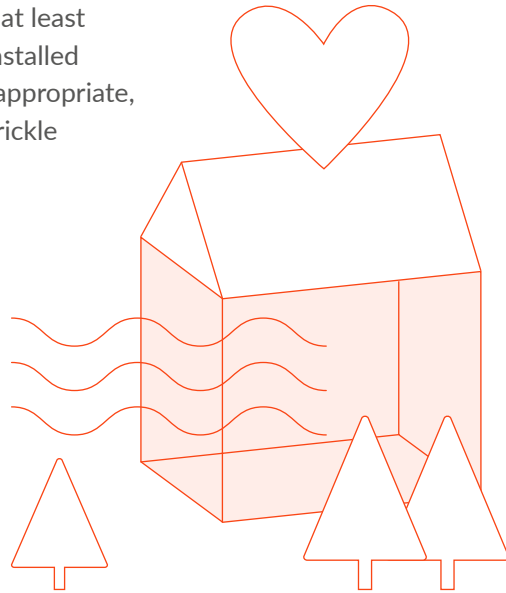
External walls	U-Value $\leq 0.13 \text{ W/m}^2\text{K}$
Floors	U-Value $\leq 0.10 \text{ W/m}^2\text{K}$
Roofs	U-Value $\leq 0.10 \text{ W/m}^2\text{K}$
Windows & doors	U-Value $\leq 1.0 \text{ W/m}^2\text{K}$
Thermal bridging	Y-Value $\leq 0.04 \text{ W/mk}$ on average

Airtightness, Air Quality & Ventilation

Airtightness $\leq 2\text{m}^3/\text{h}/\text{m}^2$ at 50 Pa, demonstrated by certified testing for each home at completion.

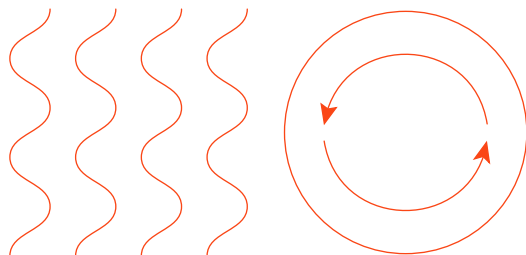
Whole Home Mechanical Ventilation with Heat Recovery (MVHR) with an efficiency of at least 90%, plus a summer bypass function, installed in smooth rigid ducts, insulated where appropriate, with minimum lengths and bends. No trickle ventilators should be provided.

New BSi standards on Health and Wellbeing, Thermal Comfort, IAQ and Ventilation are currently being created. Once completed this will form the basis of our strategy for ensuring the health and well-being of the residents.



Heat Source

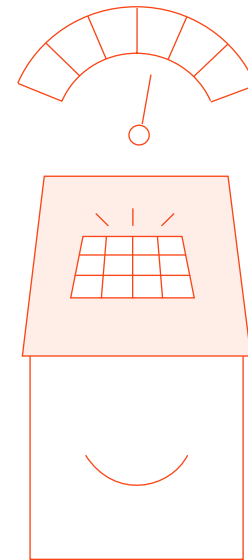
Heat pump (ground source preferred choice), variable speed compressor and compatible control interface with an open protocol.



Electrical & Renewables

Consumer unit sized and segregated for energy metering requirements to separately identify heating, hot water, regulated and unregulated, as well as energy generation with spare ways for expansion.

1.5kWp per occupant 30° South facing photovoltaic array, enlarged as needed to compensate for off-South or off pitch, or alternative zero carbon generation at site or community level providing comparable output. Off site solutions need not be physically private wired but should be virtually sheathed and dedicated to the home(s).



Connectivity & Controls

Intelligent Energy System (IES) for monitoring and control of home in harmony with energy grids, with capacity for demand side response; like the Sero BEE.

Compatible temperature, humidity, CO2, VOC & PM2.5 sensors, and controls, all not requiring batteries (hardwired, thermocouple, piezoelectric, etc.) located in habitable rooms.

Full fibre optic into each home, either twin fibres or secure split off for single fibre to IES systems.



Heat & Hot Water Distribution

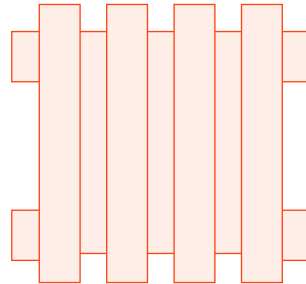
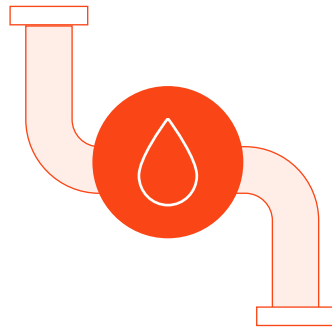
The heating system must allow a choice between the maximum efficiencies of open zoning and customer comfort requirements.

Appropriately designed heating distribution system to match building heat loss with low temperature emitters (underfloor heating / radiators).

Flow temperature <40°C for space heating.

Primary flow pipework and hot water distribution to be insulated as a minimum.

It is desirable that all baths/showers are fitted with a waste water heat recovery system to minimise unnecessary energy loss.



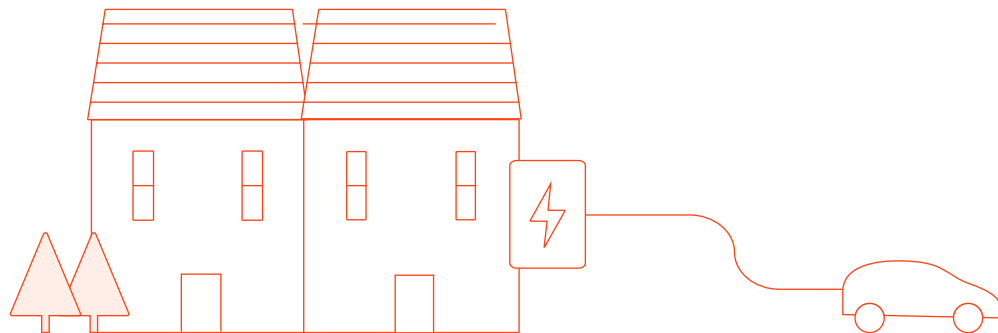
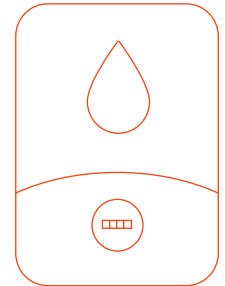
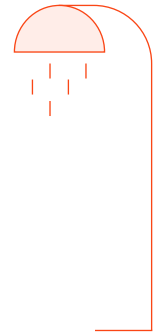
Heat & Energy Storage

Highly insulated hot water tank sized at 85 litres plus 35 litres per occupant, with heat exchanger, immersion on metered electrical connection and multiple internal temperature meters, with compatible control interface. Open protocols.

Hot water storage temperature to be designed at 50°C (with a Legionella cycle) but capable of being heated to 80°C.

High efficiency electrical storage sized at 2.5kWh per occupant, with compatible control interface. Look for warranties based on MWh throughput instead of “cycles”.

All taps/outlets should be thermostatically controlled (alternatively a thermostatic control can be fitted to the primary outlet of the thermal store).



Transport

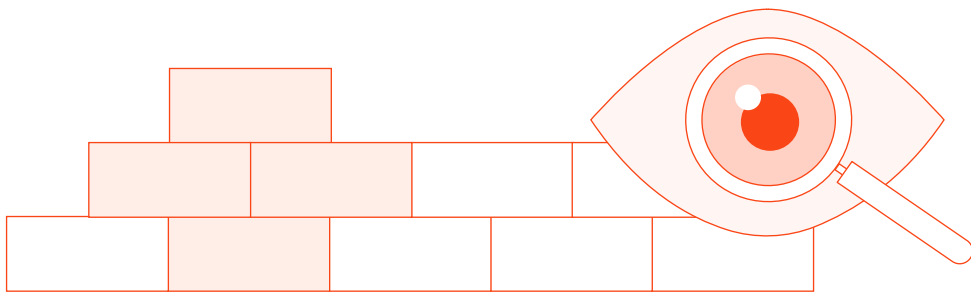
EU type 2 electric vehicle charging point with compatible control interface, minimum 7.5kwh with three phase 22kwh desirable. Install to be in accordance with Electric Vehicle Charging in Residential and Non-Residential Building guide 2019 and all infrastructure shall meet the requirements of BS 7671:2018 + A1:2020.

13amp twin socket supply to secure bike storage.

Construction Monitoring

Setting a high fabric and service specification is only part of the process. It is essential that verification and inspection of key construction details are undertaken. The harder the fabric is pushed the more critical good thermal bridging details become. The five main connection details that must be delivered on site are:

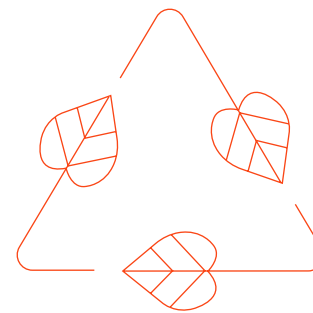
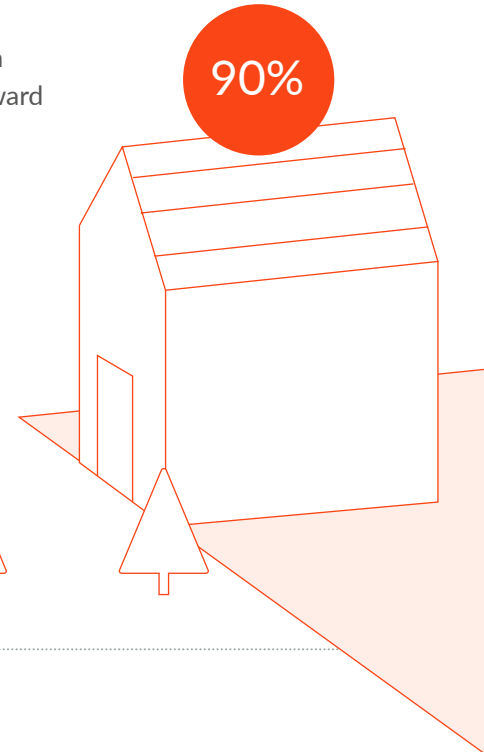
- 1 The insulated foundation & upstand to the floor slab.
- 2 The connection of the wall to the foundation.
- 3 The connection of the wall to the roof, to ensure thermal continuity.
- 4 The construction details around windows and doors.
- 5 Any penetrations & connections of services that pass through the thermal envelope.



Commissioning

One week digital commissioning & certification successfully signed-off as a pre-requisite for award of Practical Completion.

This should occur after the home has been deemed complete by the contractor (and therefore requires a week specifically included in the programme). Sero offer this service, and so far has identified and aided remediation in around 90% of all homes.



Waste

All properties are to be fitted out with arrangements to facilitate the collection of recyclable materials in line with the Local Authority collection process.

Need some help?

Sero partner with landlords and developers to support the delivery of homes that will become Net Zero in harmony with the grid.

sero Visit: sero.group